Goose Lake

Site Description

Location
Water designation number (WDN)	05-0024-00
Legal description	T116N-R54W-Sec. 13,14,15,22,23,24,26
County (ies)	Codington
Location from nearest town	7.0 miles west and 2.5 miles south of Watertown, SD

Survey Dates and Sampling Information
Survey dates	July 30-31, 2013 (GN)
Gill net sets (n)	6

Morphometry
Watershed area (acres)	18,993
Surface area (acres)	≈2100
Maximum depth (ft)	≈15
Mean depth (ft)	unknown

Ownership and Public Access
The Goose Lake fishery is managed by the SDGFP. No formal boat ramp exists on Goose Lake. A small parking lot and graveled approach to the lake were created on the south shore to facilitate boat launching (Figure 1). Unfortunately, high water levels in recent years have flooded the area making it unusable. Currently, public access is limited to flooded road rights-of-way or foot traffic across state-owned lands.   Lands adjacent to Goose Lake are owned by the State of South Dakota and private individuals.

Watershed and Land Use
The 18,993 acre Goose Lake sub-watershed (HUC-12) is located within the larger City of Watertown-Big Sioux River (HUC-10) watershed. Land use within the watershed is primarily agricultural including a mix of pasture or grassland, cropland, and scattered shelterbelts.

Water Level Observations
Water levels on Goose Lake are not monitored by SDDENR.

Fish Management Information
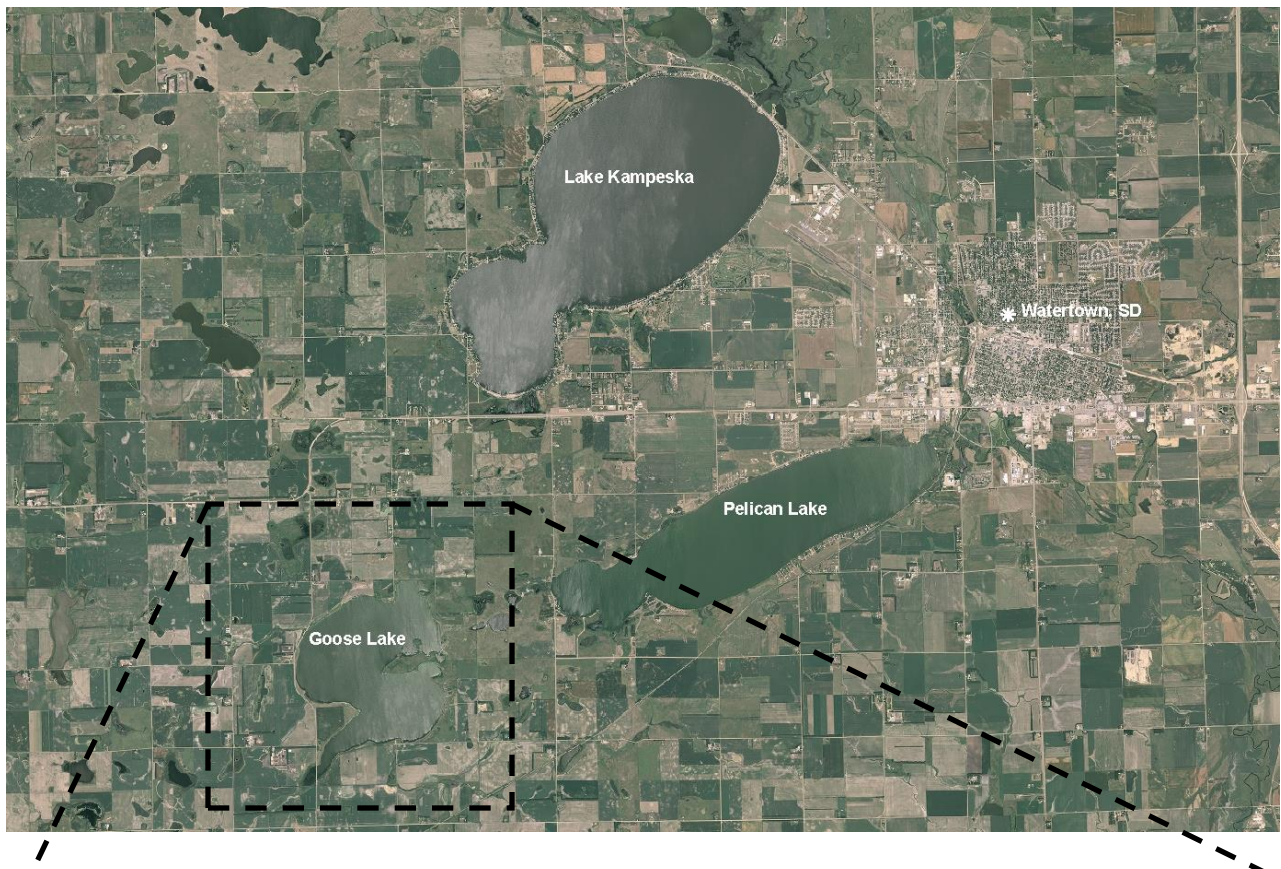|	
Primary species	Walleye, Yellow Perch
Other species	Black Bullhead, Northern Pike, Orangespotted Sunfish
Lake-specific regulations	none
Management classification	none
Fish consumption advisories	none

Figure 1. Map depicting location of Lake Kampeska, Goose, and Pelican Lakes from Watertown, SD (top). Also noted is the public access point and standardized net locations for Goose Lake. GOCGN= gill nets

Management Objectives

1) Maintain a mean gill net CPUE of stock-length walleye ≥ 10, a PSD of 30-60, and a PSD-P of 5-10.

2) Maintain a mean gill net CPUE of stock-length yellow perch ≥ 30, a PSD of 30-60, and a PSD-P of 5-10.

Results and Discussion

Prior to the 1990s, Goose Lake was a shallow slough with limited sport fishery potential. However, above normal precipitation during the mid to late 1990s increased the surface area and depth of Goose Lake diminishing the threat of winterkill and creating habitat capable of sustaining a sport fishery. Goose Lake has become popular destination for anglers targeting walleye and yellow perch.

Primary Species

Walleye: In each of the standardized fish community surveys conducted at Goose Lake (i.e., 2010 and 2013), Walleye relative abundance has been high. The 2013 mean gill net CPUE for stock-length Walleye of 36.3 (Table 1) represented a decrease from the 2010 CPUE of 42.7 (Table 2), but remained well above the minimum objective (> 10 stock-length Walleye/net night; Table 3).

Walleye captured in gill nets during 2013 ranged in total length from 11 to 48 cm (4.3 to 18.9 in), had a PSD of 24 and a PSD-P of 0 (Table 1; Figure 2). Both the PSD and PSD-P were below the objective ranges of 30-60 and 5-10 indicating a population skewed towards smaller individuals.

Otoliths were collected from a sub-sample of gill net captured Walleye. Five consecutive year classes (2009-2013) were present (Table 4). Natural reproduction contributes to the Walleye population in Goose Lake (e.g., 2010 and 2011 cohorts); while strong year classes produced in 2009 and 2012 coincided with fry stockings (Table 4; Table 6). It should be noted that the contribution of stocked or naturally-produced Walleye to the 2009 and 2012 year classes is unknown, as stocked fry were unmarked making it difficult to differentiate stocked from naturally-produced walleye. The capture of three individuals from the 2013 (age-0) year class indicates successful natural reproduction; however, recruitment of this cohort is currently unknown and will be assessed in future surveys.

In 2013, weighted mean TL at capture of age-2 and age-3 walleye was 352 and 395 mm (13.9 and 15.6 in; Table 5). Mean Wr values of Walleye in the gill net catch ranged from 86 to 90 for all length categories (e.g., stock to quality) sampled, with the mean Wr of stock-length Walleye being 89 (Table 1). No length-related trends in condition were apparent.

Yellow Perch: The mean gill net CPUE of stock-length Yellow Perch was 48.8 (Table 1) and above the minimum objective ($\geq$ 30 stock-length Yellow Perch/net night; Table 3). The 2013 gill net CPUE was substantially higher than the 2010 CPUE of 2.3 (Table 2). Currently, relative abundance is considered high.

Gill net captured Yellow Perch ranged in TL from 15 to 29 cm (5.9 to 11.4 in; Figure 3). The PSD was 69 and the PSD-P was 28, both exceeded management objectives of 30-60 and 5-10 indicating a population comprised of larger (i.e., $\geq$20 cm; 8 in) individuals.

Otoliths were collected from a sub-sample of gill net captured Yellow Perch. Age structure information suggested the presence of four consecutive year classes (2009-2012; Table 7). The 2011 cohort was the most represented and comprised 69% of Yellow Perch in the gill net catch; while the 2012 cohort comprised an additional 31% (Table 7).

The weighted mean TL at capture for age-1 and age-2 male Yellow Perch was 173 and 224 mm (6.8 and 8.8 in); while the weighted mean TL at capture for age-1 and age-2 females was 177 and 252 mm (7.0 and 9.9 in; Table 8). Gill net captured Yellow Perch had high condition with mean Wr values $\geq$ 115 for all length categories (e.g., stock to quality) sampled. The mean Wr of stock-length Yellow Perch was 123 (Table 1) and no length-related trends in condition were apparent.

Other Species

Other: Black Bullhead and Northern Pike were other fish species captured during the 2013 fish community survey (Table 1).

Management Recommendations

1) Conduct fish community surveys utilizing gill nets on an every third year basis (next survey scheduled in summer 2016) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.

2) Collect otoliths from walleye and yellow perch to assess age structure and growth rates of each population.

3) Stock walleye (≈500 fry/acre) on a biennial basis to establish additional year classes, provided water levels are sufficient.

4) Establish a public boat ramp and parking area.

5) Monitor winter and summer kill events. In cases of substantial winter/summer kill the need to re-establish a fishery in Goose Lake should be evaluated. If water levels are sufficient; Walleye and Yellow Perch should be stocked to re-establish a fish community.

Table 1. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length fish (PSD-P), and mean relative weight (Wr) of stock-length fish for various fish species captured in experimental gill nets from Goose Lake, 2013. Confidence intervals include 80 percent (± CI-80) or 90 percent (± CI-90). BLB= Black Bullhead; NOP= Northern Pike; WAE= Walleye; YEP= Yellow Perch

Species	Abundance		Stock Density Indices				Condition	
	CPUE	CI-80	PSD	CI-90	PSD-P	CI-90	Wr	CI-90
Frame nets								
BLB	2.8	0.9	100	0	71	20	111	3
NOP	0.2	0.2	100	---	100	---	88	---
WAE	36.3	7.0	24	5	0	---	89	<1
YEP	48.8	14.6	69	4	28	4	123	<1

Table 2. Historic mean catch rate (CPUE; catch/net night) of stock-length fish for various fish species captured experimental gill nets from Goose Lake, 2010-2013. BLB= Black Bullhead; NOP= Northern Pike; WAE= Walleye; YEP= Yellow Perch

Species	CPUE			
	2010	2011	2012	2013
Gill nets				
BLB	0.2	---	---	2.8
NOP	0.0	---	---	0.2
WAE	42.7	---	---	36.3
YEP	2.3	---	---	48.8

Table 3. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and mean relative weight (Wr) for selected species captured in experimental gill nets from Goose Lake, 2010-2013. WAE = Walleye; YEP = Yellow Perch

Species	2010	2011	2012	2013	Objective
Gill nets					
WAE					
CPUE	43	---	---	36	≥ 10
PSD	20	---	---	24	30-60
PSD-P	2	---	---	0	5-10
Wr	86	---	---	89	---
YEP					
CPUE	2	---	---	49	≥ 30
PSD	100	---	---	69	30-60
PSD-P	71	---	---	28	5-10
Wr	114	---	---	123	---

Table 4. Year class distribution based on the expanded age/length summary for walleye sampled in gill nets and associated stocking history (# stocked x 1,000) from Goose Lake, 2010-2013.

Survey Year	Year Class									
	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
2013	3	163	67	43	10					
2010	---	---	---		528	78	5	3	2	1
# stocked										
fry		800			800					
small fingerling										
large fingerling										

Table 5. Weighted mean total length (mm) at capture for walleye age-0 through age-6 captured in experimental gill nets (expanded sample size) from Goose Lake, 2010-2013. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

Year	Age						
	0	1	2	3	4	5	6
2013	119(3)	254(163)	352(67)	395(43)	432(10)	---	---
2010	---	243(528)	383(78)	485(5)	519(3)	510(2)	587(1)

Table 6. Stocking history including size and number for fishes stocked into Goose Lake, 2004-2013.

Year	Species	Size	Number
2009	WAE	fry	800,000
2012	WAE	fry	800,000

Table 7. Year class distribution based on expanded age/length summary for Yellow Perch sampled in gill nets from Goose Lake, 2010-2013.

Survey Year	Year Class							
	2013	2012	2011	2010	2009	2008	2007	2006
2013		90	201	1	1			
2010	---	---	---			9		5

Table 8. Weighted mean total length (mm) at capture by gender for Yellow Perch captured in experimental gill nets (expanded sample size) from Goose Lake, 2010-2013. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

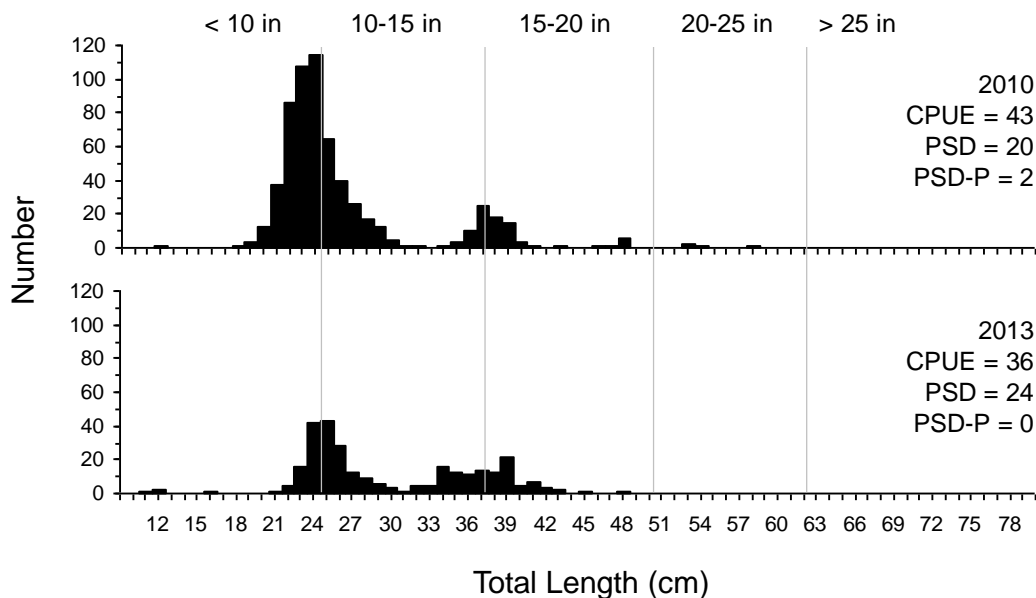| Year	Age			
	1	2	3	4
2013				
Male	173 (42)	224 (63)	---	---
Female	177 (47)	252 (133)	290 (1)	298 (1)
Combined	175 (90)	243 (201)	290 (1)	298 (1)
2010				
Male	---	244 (4)	---	---
Female	---	260 (5)	---	322 (5)
Combined	---	253 (9)	---	322 (5)

Figure 2. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Walleye captured using experimental gill nets in Goose Lake, 2010-2013.
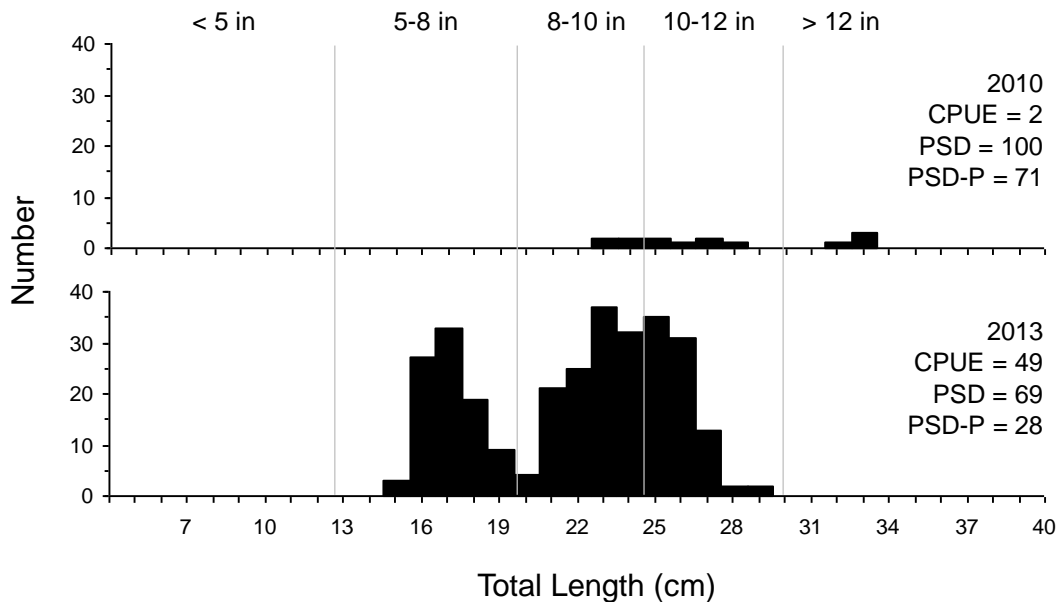

Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Yellow Perch captured using experimental gill nets in Goose Lake, 2010-2013.